Wildlife in the City

Conserving Natural Habitats in Tucson

Bill Shaw

Javelina pass through a Tucson back yard

At dawn the jackrabbits scatter like birdshot through the underbrush: a coyote trots out of the mesquites and paloverdes lining the wash. Quail families scuttle past, and a small herd of javelinas looks for prickly pear. A rustle in the bursage turns into a fleeting glimpse of mottled green lizards, while cactus wrens dart overhead among saguaros framed against the rising sun. Twenty feet away, schoolchildren wait for the bus.

This close proximity to wildlife is a daily occurrence in many parts of Tucson, but it can only continue if residents and businesses preserve the habitats that offer food, water and shelter for these animals. Bill Shaw, a wildlife ecologist in the School of Renewable Natural Resources (SRNR) at The University of Arizona, believes Tucsonans care enough about their unique desert environment to do something to maintain it right in town.

"In Tucson there is a tremendous concern for this--public concern for riparian areas and to ensure that the native flora and fauna of the Sonoran desert persist in this area," he says. "Unlike many communities where you can't determine exactly where you are by looking at the vegetation, Tucson is unique. Many of the birds, animals and plants here can't be found in other parts of the western U.S. We're interested in integrating conservation into metropolitan planning in Tucson."

Shaw heads a group of College of Agriculture researchers who have just finished a project aimed at identifying the most important areas for wildlife within a metropolitan area. Their goal is to provide information to city and county planners who make the decisions about how the land will be used.

Team participants, all from the SRNR, included Shaw, who directed the project; Lisa Harris, a wildlife ecologist; Margaret Livingston, a plant ecologist; Jean-Paul Charpentier , a graduate student, and Craig Wissler, a faculty member in the SRNR's Advanced Resource Technology lab (ART lab) for computerized mapping and analyses. They completed the project in 1996.

"We are making wildlife management decisions when we make land use decisions," Shaw says. In choosing a golf course over low density housing, for example, planners are also influencing how many and what types of species of wildlife will flourish on that land. Wide open golf greens support different types of wildlife than the dense shrubbery does around housing developments.

"What we have not had in the past is answers to questions like how much land within different urban land uses is actually available as wildlife habitat," Shaw says. How much native vegetation remains and how is vegetation distributed within a land use type?

To find out, Shaw and his associates completed a habitat inventory for eastern Pima county, encompassing Tucson and surrounding land running west to Avra Valley, south to Green Valley, east to Saguaro National Park East, and north to Marana.

Shaw believes that protecting and enhancing plant communities, especially native plants, is the most powerful wildlife management tool developers, planners and homeowners have in an urban environment.

How did they cover such a large territory?

"We wanted to look at what you see from the sky," Shaw explains. They did this by first obtaining aerial photos of the entire area, and then dividing them into smaller units they visited and sampled from on the ground. "Truthing," as it is called, involved walking through neighborhoods and commercial zones to systematically measure and identify the plants that were photographed from the air, and to compile an accurate list of the kinds of habitats Tucson offers for wildlife. They spent 1100 hours sampling vegetation.

"We chose a random scientific sample each urban land use category," Shaw says. "It took a year. We had to select vegetation measurement methodologies and then go out and sample each type of urban and suburban landcover. It took some new methodologies because ecologists don't normally work in a metropolitan area."

The Pima County Habitat Inventory project actually had two phases. During a pilot study completed in 1993 the researchers developed a methodology for associating land cover categories to aerial photographs. The researchers then were able to apply these techniques to mapping and classifying vegetation in the 43 townships they studied in eastern Pima County.

The final phase of the project took one year and was funded by the Arizona Game and Fish Heritage Fund.

"Our first task was to combine the land use data for the City of Tucson and Eastern Pima County, a major task," Shaw says. The researchers had two sources for the base data — the city's and the county's databases, which they converted to land cover categories and merged into one GIS (geographic information system) database. This system covers both incorporated and unincorporated areas of metropolitan Tucson.

"Then we sampled the vegetation, and produced maps for each type of land use," Shaw says. In housing areas, the team measured all perennial vegetation three inches or larger in canopy diameter or height, plus lawns for each plot selected. For larger areas, they ran randomly located transects across various parts of a property and recorded and measured the plants encountered in the two-foot wide belt transect.

Land cover classification categories for eastern Pima County included residential, commercial/public facilities, recreation, watercourses and ponds, natural open space, graded vacant land, agricultural land, and major transportation facilities.

At each sampling unit eight types of information were recorded: plant species, height, diameter, indigenous nature, number of distinct plants of one

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species planted together, how the plant was used (tree, shrub, ground cover, etc), basal cover of vegetation, and area of the sampling unit.

"We compared patterns of landscaped or planted vegetation with natural vegetation," Shaw explains. "Then we developed a 'wildlife habitat value index' based upon how much of each land cover category is vegetated, how much is native vegetation, how much structural diversity (forms or heights of vegetation present in a landscape) is found, how much escape cover is available for wildlife."

Frequently, it is the escape cover that is most limited in urban landscapes. Wildlife need shrubs and brushes nearby to protect them from predators. "Low-based vegetation makes great underbrush for rabbits, quail and other animals," Shaw notes. In fact, homeowners destroy this habitat when they clear out all the underbrush in their yards and replace it with decorative rock surrounding a few mesquite trees and saguaros. It looks clean and neat, but there is no escape cover.

Shaw and his team used the data they collected to generate maps of the 43 townships they studied in Eastern Pima County. They have made the computer based maps as current and useful as possible: as new land information becomes available in the future, the maps can be readily updated. They interpreted the maps and verbally described wildlife habitats in Tucson.

"We developed the wildlife habitat value model based on vegetative characteristics," Shaw says. "We stress native vegetation and plant species diversity as important elements in the model." The researchers ranked different land uses in Tucson according to their suitability for wildlife, and made recommendations for future planning and development (see sidebar).

A significant finding was that natural open space occupies by far the most acreage in eastern Pima county. "With such a large portion of the greater Tucson area in this condition, it allows the community to direct future growth and development to preserve an interconnected system of plant communities," the report states. Riparian areas made up only 6% of the land, an alarmingly low percentage since riparian vegetation communities associated with watercourses are among the most valuable wildlife habitats.

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To that end, the study offers several recommendations for decision makers to follow for incorporating wildlife conservation into planning for growth in Tucson and Eastern Pima County:

1. Preserve an interconnected network of landscapes with the highest values as habitats for wildlife. This is the single most important strategy for integrating conservation into planning for Tucson's growth, according to the research team.
2. Identify gaps and fragmentation in Tucson habitats and restore their vegetative continuity. Especially valuable are vegetative corridors that reach from the large protected natural areas surrounding Tucson into suburban and urban areas. The habitat value index maps can be used for this purpose.
3. Emphasize the use of native plant species. Native animals are best adapted to utilize native plant communities.
4. Utilize a diverse array of plant species and plant forms in planted landscapes. This will support a wide variety of animals that have different habitat requirements.

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"It seems a surprise to everybody, but Tucson is actually a leader in this urban conservation," Shaw remarks. "Boulder, Ft. Collins, Portland and Seattle are all cities that are making an effort to do this as well. In Tucson, both the community and elected officials are interested in this. And some of my students have made careers out of working with the development community to help soften their impact on the environment."

Sometimes the only way to protect a natural habitat is through legislation, Shaw admits.

"The dilemma is how do you translate this into laws and regulations that are equitable and feasible?" he asks. "We're trying to develop an information base so that as a community we can say which areas are most important biologically. There are a lot of things that are unique and special about Tucson's native plants and animals."

— Susan McGinley

Land Cover Classifications in Eastern Pima County

Natural Open Space	52%
Residential	13%
Parks and Playgrounds	11%
Agricultural	7%
Watercourses and Ponds	6%
Commercial and Public Facilities	6%
Major Transportation Facilities	3%
Graded Vacant Land	2%

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